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(71) Applicant: **PACESETTER INFUSION LTD.**
trading as MINIMED TECHNOLOGIES
12884 Bradley Avenue
Sylmar California 91342(US)

(72) Inventor: **Gorton, Lanny A.**
10728 Westcott Avenue
Sunland California 91040(US)
Inventor: **Schmidt, Gerald W.**
7330 Coati Place
Ventura California 93003(US)

(74) Representative: **Rees, David Christopher et al**
Kilburn & Strode 30 John Street
London WC1N 2DD(GB)

(54) Clamp fixture.

(57) A clamp fixture (10) for supporting a medical instrument (12) in a selected orientation relative to a variety of different support structures, such as an upright pole (14), a tabletop edge, a bed rail, etc. The clamp fixture comprises an open-sided base bracket (16) for receiving the support structure to extend through the base bracket along a first axis (19). A clamp screw is carried by the base bracket (16) and is adjustable to retain the support structure (14) against an inner support surface of the base bracket (16). A frame member (18) is mounted on the base bracket for rotation generally about a second axis (20) perpendicular to the first axis, with a spring-loaded lock pin (94) releasably securing the frame member (18) in one of several present rotational positions. Two frame arms (22) extend from the frame member (18) for connection to the instrument (12) in a manner permitting rotation of instrument (12) about a third axis (24) perpendicular to the first and second axes. A detent lock mechanism (194,102) cooperates between the instrument (12) and each frame arm (22) to releasably lock the instrument in a selected position of rotational adjustment. The clamp fixture includes an adjustable clutch mechanism (62,64,66) for controlling the clamping force which can be applied by the clamp screw (42) to a support structure (14). The clutch mechanism can be adjusted by a specialised tool (67) after engaging the support structure (14) to prevent unauthorised removal of theft.

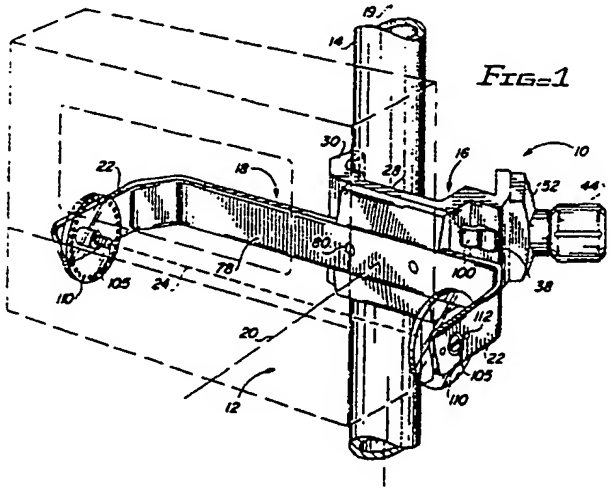

FIG-1

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CLAMP FIXTURE

This invention relates generally to clamp-type mounting devices for example for supporting fragile medical instruments with respect to a conveniently available support surface or structure. More particularly, this invention relates to a clamp fixture adapted for stable connection to a variety of different supported structures, with an adjustment capability to permit the medical instrument to be supported in a selected orientation.

In the medical arts, a wide variety of relatively sophisticated medical instruments including electronic devices and the like are available and are used frequently during the course of patient treatment. For example, in a hospital or medical clinic environment, a variety of electronic instruments may be required to monitor selected parameters indicative of patient condition, or to deliver selected fluids to the patient in accordance with a prescribed time schedule, or to perform a variety of other important functions in patient diagnosis or treatment. When use of such devices is desired or required, the appropriate instrument is normally transported from a storage site to the patient location, such as the patient's bedside in a hospital, and is there appropriately coupled to or otherwise operated in conjunction with the patient to perform the desired functions.

In recent years, advances in the electronic arts particularly with respect to solid state technology have permitted many such medical instruments to be constructed with a relatively small, preferably handheld size for optimum portability and minimum obstruction of the bedside location or the like.

The relatively small size of many modern electronic medical instruments and the like necessitates the use of some type of clamping or locking device to prevent the instrument from being knocked about or otherwise inadvertently moved during instrument operation. With such a clamping or locking device, the instrument can be retained in the desired close proximity with the patient in a manner minimising any risk of disrupting electrical or fluid flow lines coupled between the instrument and the patient. In addition, the clamping or locking device functions to retain the instrument in a predetermined orientation which may be required for proper instrument operation, or for easy viewing of any parameters displayed by the instrument, or for ease of adjustment of instrument controls etc.

In the past, clamping or locking devices used to support relatively small medical instruments and the like have generally been designed to lock onto a specific type of support structure. For example, many spring-loaded and screw-down type clamps have been proposed for securely locking onto a vertical pole of the type used commonly to support intravenous (IV) fluid infusion equipment. Other types of clamps have been designed to lock onto other specific surfaces, such as the edge of a horizontal tabletop. However, these prior clamp devices generally have not provided satisfactory instrument anchoring or proper instrument orientation when the clamp device is locked onto an alternative support structure which differs from the one for which it was specifically designed. Accordingly, hospitals and the like have been required to obtain different types of clamping devices designed to lock onto different support structures, or, alternatively, to provide the same type of support structure such as an upright IV pole each time the particular instrument is used.

There exists, therefore, a significant need for an improved clamping device for use in securely supporting and orienting a medical instrument or the like, the clamping device being adapted to lock securely onto a variety of different support structures commonly present in a medical environment, and to permit the orientation of the supported medical instrument to be adjusted as desired to a selected position. It is an object of the invention to provide such a device.

According to the invention, there is provided a clamp fixture for supporting an instrument in a selected orientation relative to a selected support structure, characterised by: a base bracket including means for locking onto a selected support structure extending generally along a first axis; a frame member carried by the base bracket for rotation with respect to the base bracket about a second axis at an angle to the first axis; first releasable lock means for locking the frame member against rotation about the second axis relative to the base bracket; the frame member including at least one frame arm; means for connecting the or each frame arm to the instrument to permit rotation of the instrument with respect to the or each frame arm about a third axis at an angle to the first and second axes; and second releasable lock means for locking the instrument supported by the or each frame arm against rotation about the third axis relative to the or each frame arm, the three axes preferably being mutually perpendicular.

Preferably the base bracket bracket has a generally U-shaped configuration defining an axial channel extending along the first axis, the said base bracket having an inner bracket support surface and an adjustable clamp screw movable towards and away from the inner bracket support surface for respectively clamping and releasing the

support structure relative to the inner bracket support surface, the inner bracket support surface preferably including surface portions of different configuration for respectively engaging support structures of different geometry.

Preferably, a first surface portion, defines an elongate, generally semi-cylindrical recess extending generally in parallel to the first axis, and a second surface portion defines a pair of relatively flat platforms on either side of the recess and optionally a resilient liner is located over the first and second surface portions.

In a preferred embodiment, the base bracket includes a central support leg, the frame member being rotatably supported from the central support leg, and a primary support leg oriented at an angle of about sixty degrees relative to the central support leg, a clamp screw being supported by the base bracket for movement towards and away from the primary support leg at an angle of about ninety degrees to the primary support leg.

There may be an adjustment knob rotatably supported by the base bracket, and a clutch arrangement interconnecting the adjustment knob and the clamp screw whereby the clamp screw is movable towards and away from the inner bracket support surface by manual rotation of the adjustment knob, the clutch means optionally being adjustable to vary the maximum torque transfer between the adjustment knob and clamp screw preferably by means of a non-standard adjustment tool.

In a preferred embodiment the clutch arrangement comprises a spring plate carried by the adjustment knob, a cap member carried by the clamp screw and having at least one recessed seat, a drive ball urged by the spring plate into the recessed seat and an adjustment screw carried by the adjustment knob in bearing engagement with the spring member, a specialised adjustment tool being engageable with the adjustment screw to vary the spring force applied to the drive ball by the spring plate.

Preferably the clamp screw includes an inboard end presented generally towards the inner bracket support surface and a resilient shield covering the clamp screw inboard end.

Preferably, the first releasable lock means includes means for releasably locking the frame member relative to the base bracket at rotational intervals of about ninety degrees, the first releasable lock means optionally comprising a spring-loaded lock pin carried by the base bracket, a plurality of recesses formed in the frame member, each recess being positioned to receive the lock pin when suitably aligned, and a trigger lever on the base bracket connected to the lock pin for manually retracting the lock pin from the aligned recess to permit rotation of the frame member relative to the base bracket.

Preferably, the second releasable lock means comprises a detent mechanism for releasably supporting the instrument in one of a number of angular positions relative to the or each frame arm, the detent mechanism optionally comprising an index disc mounted on the or each frame arm and defining a generally circular array of recessed detents, and a mounting shoe engaging the or each frame arm generally along the third axis and arranged to be connected to the instrument, the mounting shoe supporting a detent ball for removable reception into one of the recessed detents in the index discs, the detent ball optionally being biased outwards from the mounting shoe.

In the preferred embodiment there are a pair of frame arms, each having connecting means for engaging a respective side of the instrument, and each having second releasable lock means releasably locking the instrument relative to the respective frame arms. Thus, in a preferred form of clamp fixture, the base bracket includes clamp means for locking onto the selected support structure, the clamp means including a clutch mechanism to prevent application of clamping forces to the support structure beyond a predetermined limit. The base bracket includes surface means for securely engaging and supporting different support structures of different geometry. The first releasable lock means comprises a spring-loaded lock pin on the base bracket for reception into a selected one of a plurality of recesses formed in the frame member, and a manually retractable trigger lever for manually retracting the lock pin from the frame member. The second releasable lock means comprises a detent mechanism cooperating between the frame arm and the instrument. The clamp fixture also includes a mounting shoe adapted for connection to the instrument the detent mechanism cooperating between the frame arm and the mounting shoe.

The invention also extends to a clamp fixture for supporting an instrument or the like in a selected orientation relative to a selected support structure, the, the clamp fixing comprising a generally U-shaped base bracket of open-sided construction defining an axially open channel extending generally along a first axis, the base bracket including a primary support leg having a first inner support surface defined by an elongate and generally semi-cylindrical recess oriented generally parallel to the first axis, and a second surface defined by a pair of relatively flat platforms on the opposite sides of the recess; a clamp screw carried by the base bracket for movement towards and away from the support leg for respectively locking onto and releasing the selected support structure; an adjustment knob carried by the base bracket; a

clutch mechanism connected between the adjustment knob and the clamp screw; a generally U-shaped frame member having a central frame bar and a pair of generally parallel frame arms; pivot means for rotatably connecting the central frame bar of the frame member to the base bracket for rotation of the frame member about a second axis oriented generally perpendicular to the first axis; first releasable lock means for releasably locking the frame member against rotation about the second axis in a selected position of rotational adjustment; and detent means carried by the pair of frame arms adapted for connection coaxially to the instrument to permit rotation of the instrument relative to the frame arms about a third axis oriented generally perpendicular to the first and second axes, the detent means including second releasable lock means for releasably locking the instrument against rotation about the third axis in a selected position of angular adjustment.

In accordance with the invention, an improved clamp fixture is provided for use in supporting a medical instrument or the like with respect to a selected available support structure, and in a selected orientation for ease of instrument use and access. The clamp fixture is designed to lock in a secure and stable manner onto a variety of different horizontally or vertically oriented or other support structures, and then to undergo appropriate adjustment to position a supported medical instrument or the like in the desired orientation.

In a preferred form of the invention, the clamp fixture comprises a base bracket having a contoured, approximately U-shaped geometry to receive the selected support structure. The base bracket defines a plurality of inner bracket support surfaces of different geometry for stable engagement of different support structures. At least one of the inner bracket support surfaces defines an elongate recess of curved part-cylindrical geometry for fitting closely against an upright pole of generally circular cross section, whereas at least one other inner bracket support surface defines a relatively flat surface for fitting snugly against a horizontal tabletop surface or the like. A clamp screw carried by the base bracket is advanced by rotation of an adjustment knob for clamping the selected support structure firmly against the appropriate inner bracket support surface. A clutch mechanism is coupled between the adjustment knob and the clamp screw to prevent application of excessive clamping forces to the support structure. The clutch mechanism is adapted for adjustment by means of a specialised tool to permit selection of the clamping force to be applied to the support structure, and, if desired, to reduce torque transmission between the adjustment knob and the clamp screw after support structure engagement to prevent unauthorised removal or theft of the clamp fixture.

The preferred base bracket rotatably supports a frame member to permit adjustment in the orientation of the frame member in accordance with the particular support structure to which the base bracket is attached. In the preferred form, the frame member comprises a generally U-shaped component having a central frame bar supported on the base bracket for rotation about an axis generally perpendicular to a primary axis of the support structure engaged by and extending through the base bracket. A spring-loaded lock pin carried on the base bracket is releasably engaged with the frame member to lock the frame member releasably in one of several rotational positions, such as at ninety degree intervals relative to the base bracket.

The frame member in turn supports at least one frame arm adapted for connection to the selected medical instrument for supporting the instrument in one of a plurality of rotational positions. In the preferred form, the medical instrument is releasably locked in the selected rotational position relative to a rotational axis oriented generally perpendicular to the frame member rotational axis and the primary axis of the support structure engaged by the base bracket. Accordingly, irrespective of the orientation of the support structure engaged by the base bracket, the combination of rotational adjustments of the medical instrument relative to the frame arm and the frame member relative to the base bracket permits the medical instrument to be supported in substantially any desired orientation.

With the generally U-shaped frame member, a pair of generally parallel frame arms are located at opposite ends of the central frame bar for coaxial attachment to opposite sides of the medical instrument. Appropriate fasteners such as screws are fastened through the frame arms into a respective pair of mounting shoes which are secured in turn to the medical instrument. A detent lock mechanism includes index discs mounted at the inboard sides of the frame arms and including inwardly presented recessed detents in annular arrays. These recessed detents on the index disc are positioned to receive detent balls on the mounting shoes, whereby the mounting shoes can be releasably rotated along with the medical instrument to a selected one of a plurality of rotational positions by shifting the detent balls to engage different detents formed in the index discs.

The invention may be carried into practice in various ways and one embodiment will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view illustrating a clamp fixture in accordance with the invention, shown mounted onto an upright support pole;

Figure 2 is a top plan view of the clamp fixture of Figure 1;

Figure 3 is an enlarged partial vertical section taken generally on the line 3-3 of Figure 2;

Figure 4 is a further enlarged partial vertical section taken generally on the line 4-4 of Figure 3;

Figure 5 is an enlarged partial vertical section taken generally on the line 5-5 of Figure 2

Figure 6 is an enlarged partial horizontal section taken generally on the line 6-6 of Figure 2;

Figure 7 is an enlarged partial vertical section taken generally on the line 7-7 of Figure 2;

Figure 8 is an enlarged partial vertical section taken generally on the line 8-8 of Figure 2;

Figure 9 is an enlarged partial vertical section taken generally on the line 9-9 of Figure 2; and

Figure 10 is a side elevation showing the clamp fixture in an alternative mounting position.

A clamp fixture referred to generally by the reference numeral 10 is provided for use in supporting a selected medical instrument 12 (Figures 1 and 2) in a secure and stable manner. The clamp fixture 10 is designed as an essentially universal clamping device for locking onto a variety of different types of support structures, such as an upright pole 14 as shown in Figure 1, while permitting positional adjustment of the supported medical instrument 12 to a selected orientation.

The clamp fixture 10 is designed primarily for use in supporting the medical instrument 12 in a stable selected orientation in close proximity with a patient (not shown) associated with the instrument. Although the clamp fixture 10 shown is intended primarily to support an insulin infusion pump of the type used to deliver scheduled insulin doses to a diabetic patient, it will be understood that the clamp fixture can be used to support many other types of medical and non medical instruments and accessories which will typically include electronic components. The clamp fixture provides a stable base locked onto an available support structure which may differ in type and physical orientation when the instrument is moved from one location to another for use. The clamp fixture accommodates attachment to such different support structures by including multiple adjustment features for reorientation of the medical instrument to the desired optimum position chosen, for example for proper instrument operation, easy visibility of parameters displayed by the instrument, and/or access to instrument control components.

The clamp fixture 10 comprises a base bracket 16 adapted to lock onto the selected support structure such as the standard vertical pole 14 used to support intravenous (IV) fluid infusion equipment. A frame member 18 is rotatably connected to the base bracket 16 for rotation about an axis 20 oriented generally perpendicular to the central axis 19 of the upright pole 14, and this frame member 18 in turn includes a pair of frame arms 22 equipped with means for rotatably supporting the medical instrument 12 relative to an axis 24 which is perpendicular to the base bracket axis 20 and the pole axis 19. Releasable lock means are provided, as will be described, for securing the frame member 18 to the base bracket 16, and for securing the instrument 12 to the frame arms 22. Accordingly, irrespective of the orientation of the support structure to which the base bracket 16 is attached, the frame member 18 and the frame arms 22 can accommodate orientation of the medical instrument 12 in substantially any desired position.

The base bracket is generally U-shaped defining an axially open internal channel 26 extending in a direction generally parallel to the vertical axis 19 of the pole 14. The channel 26 is open-sided to enable it to receive the pole 14 or other support structure into the channel 26. The base bracket 16 includes a number of inner surfaces with different contours to fit snugly and firmly against different types of support structures. The preferred base bracket configuration includes a central bracket leg 28 joined at one end to a primary support leg 30 which is included, for example, at an angle of about sixty degrees, to the plane of the central leg 28. This primary support leg 30 has an inner surface defining an axially elongate recess 32 of generally part-cylindrical cross section, flanked on both sides by generally flat platforms 34. A resilient liner 36 of a plastics material or the like is provided as an overlay for the recess 32 and adjoining platforms 34 to prevent scratching of an engaged support structure.

The base bracket 16 also includes a secondary support leg 38 which is joined to the opposite end of the central bracket leg 28 by a short extension leg member 38. This secondary support leg 38 is angularly set at a position generally in parallel with the primary support leg 30 and includes a threaded bore 40 (Figure 3) through which a threaded clamp screw 42 extends. An adjustment knob 44 mounted on the leg 38 is manually rotatable to advance or retract the clamp screw 42 respectively towards and away from the primary support leg 30 in order to clamp the selected support structure against the primary support leg 30.

The adjustment knob 44 and its connection to the clamp screw 42 are shown in more detail in Figures 3 and 4. The clamp screw 42 extends through the threaded bore 40 to the outboard side of the secondary support leg 38. At the outboard end, the clamp screw 43 carries a radially enlarged drive key 46 secured to it by a press-fit pin 47. This drive key 46 projects radially beyond the outer diameter of the clamp screw 42 to extend into a

diametrically opposed pair of longitudinal slots 48 formed in the inner surface of a drive sleeve 50. The support leg end of the drive sleeve 50 is radially enlarged to provide a thrust component held axially against the outboard side of the secondary support leg 38 by an outer housing 52 of generally complementary shape. Screws 54 are fastened through the leg 38 into the housing 52 to hold the housing in place. The drive sleeve 50 is keyed by a pin 56 for rotation with a driven cap 58 mounted on its outboard end. The adjustment knob 44 is supported in turn for rotation about the driven cap 58, with a thrust ring 60 on the knob 44 being captured between the axially facing ends of the housing 52 and the driven cap 58 to prevent significant axial movement of the knob 44.

Rotational movement of the adjustment knob 44 is coupled via a clutch mechanism to the driven cap 58 for rotating the clamp screw 42. More specifically, an end plate 44′ and the driven cap 58 define axially facing pairs of recessed seats 61 and 62 for receiving a corresponding pair of drive balls 64. A spring plate 66 within the end plate 44′ urges the drive balls 64 partially from the end plate seats 61 for reception in the seats 62 in the driven cap 58. In this position, the drive balls 64 are engaged between the side edges of the pairs of seats 61 and 62 to transmit rotary motion from the adjustment knob 44 to the driven cap 58 and so to the clamp screw 42. However, in the event of rotational forces exceeding the biasing effect of the spring plate 66, the drive balls 64 will ride axially into the end plate seats 61 and so will disengage from the driven cap 58. Accordingly, excessive turning torques cannot be applied to the clamp screw 42. A set screw 68 is provided in the end plate 44 bearing against the centre of the spring plate 66 for adjusting the spring plate force applied to the drive balls 64.

The clamp screw 68 includes a recessed socket or head 69 of any suitable specialised non-standard cross sectional shape, such as a triangular shape or the like, for receiving the end of a specialised adjustment tool 67. This permits the set screw 68 to be advanced axially towards the spring plate 66 to increase the torque transmission between the knob 44 and the clamp screw 42, thereby allowing a greater clamping force to be applied to an engaged support structure. Alternatively, the set screw 68 can be retracted axially in a direction away from the spring plate 66 to reduce the spring force urging the drive balls 64 into the driven cap seats 62, thereby decreasing torque transmission to the clamp screw 42. In this regard, the specialised tool 67 can be used to adjust the set screw 68 for a high clamping force to permit secure clamping engagement with a support structure, followed by set screw readjustment for insufficient torque transmission to retract the clamp screw 42 from the support structure. This technique, using the specialised adjustment tool 67, prevents unauthorised removal of the clamp fixture 10 from the support structure, to prevent loss or theft of the clamp fixture.

Accordingly, rotation of the adjustment knob 44 is effective to advance the inboard end of the clamp screw 42 into engagement with a support structure within the base bracket channel 26. For ease of operation, the inboard end of the clamp screw is fastened by staking or the like to a cylindrical base ring 70 which is rotatable relative to the clamp screw. A plastic shield 72 is mounted by press-fitting onto the base ring 70 to prevent scratching of the engaged support surface. In the case of the upright pole 14 shown in Figure 1, advancing of the clamp screw 42 against the pole 14 causes the pole 14 to be firmly seated in a locked position within the semi-cylindrical recess 32 of the primary support leg 30. In this configuration, the pole 14 extends axially through the channel 26.

Alternatively, the base bracket 16 can be locked onto other support structures such as the edge 74 of a tabletop 76 as shown in Figure 10, with the clamp screw 42 seating the tabletop securely against the flat platforms 34 of the primary support leg 30. Other support structures may be engaged by the base bracket 16 and appropriately clamped between the clamp screw 42 and the primary support leg 30.

The frame member 18 comprises a generally U-shaped component including a central frame bar 78 pivotally connected to the base bracket 16 and a pair of parallel, outwardly projecting frame arms 22. As shown in Figures 1 and 6, this central frame bar 78 is fastened by rivets 80 or the like to a generally rectangular pivot plate 82. In turn, the pivot plate 82 is rotatably supported by a pivot pin 84 (Figure 5) fastened into the central bracket leg 28 of the base bracket 16 to permit rotation of the entire frame member 18 about the rotational axis 20. While this pivot connection may take various forms, Figure 5 shows a threaded pivot pin 84 fastened into the threaded bore of a bushing nut 86 supported by the base bracket. The bushing nut 86, has a radially enlarged inboard end which acts as a thrust member when the pivot pin 84 is connected to it. A wave spring washer 88 is provided to effectively lock the pin 84 and busing nut 86 against relative rotation during rotation of the frame member 18. Moreover, if desired, a small wear ring 90 of a suitable low friction material can be located between the axially outboard end of the bushing nut 86 and the pivot plate 82, and a larger annular wear pad 92 of a plastics material or the like can be placed between the bracket leg 28 and

the pivot plate 82.

A spring-loaded lock pin 94 (Figures 1 and 2) is carried by the base bracket 16 to provide a releasable lock for locking the pivot plate 82 and frame member 18 against rotation relative to the base bracket 16. However, the lock pin 94 can be retracted quickly and easily by a simple manual operation to permit rotation of the pivot plate 82 and the frame member 18 to a new rotational position relative to the base bracket. Accordingly, when the base bracket 16 is locked onto a selected available support structure, the frame member 18 can be reoriented as desired to a new adjustment position.

As shown best in Figure 7, the spring-loaded lock pin 94 is mounted within a shallow bore 96 formed in the extension leg member 38 of the base bracket support leg 38. This bore 96 is interrupted generally at a midlength position by a laterally open window 98 within which a trigger lever 100 is connected to the lock pin 94. A biasing spring 101 within the base of the bore 96 normally urges the lock pin 94 and the trigger lever 100 in a forward direction such so that an end tip 94′ on the lock pin 94 seats within an aligned shallow recess 102 formed in the inboard end of the pivot plate 82. The engagement of the lock pin in a pivot plate recess 102 effectively locks the entire frame member against rotation relative to the base bracket.

When adjustment of the frame member 18 to a new rotational position is desired, the trigger lever 100 can be retracted quickly and easily by rearward fingertip pressure in the direction of arrow 104 in Figure 7. This withdraws the end tip 94′ of the lock pin 94 from the pivot plate recess 102 to permit the frame member to be rotated freely to a new position of rotational adjustment. When the selected new adjustment position is reached, the trigger lever 100 is allowed to return by action of the biasing spring 101 and the end tip 94′ is seated into a new pivot plate recess 102 aligned therewith. In this regard, in the preferred from of the invention (Figure 8), four recesses 102 are provided to permit the frame member to be located at ninety degree intervals. Alternatively, any number of such recesses can be provided for appropriately locking the frame member 18 at other rotational positions, as desired.

The frame arms 22 are adapted for connection generally to the opposite sides of the supported medical instrument 12, and to this end, they include coaxially aligned ports which house mounting screws 105 extending towards each other along the rotational axis 24 (Figures 1 and 2). The mounting screws 105 are fastened into a corresponding pair of mounting shoes 106 which are connected in turn by screws 108 or the like to the selected instrument 12. The mounting shoes 106 are fastened to a rear face of the instrument 12 at the outside corners of the instrument housing, although it will be understood that the mounting shoes may be attached directly to the outboard sides of the instrument housing, or to any other convenient portions of the instrument housing.

The frame arms 22 further include a respective pair of index discs 110 which cooperate with the mounting shoes 106 to provide a detent lock mechanism for securely locking the instrument in a selected angular position relative to the axis 24. These index discs 110 are mounted coaxially on the frame arms 22 by small fasteners 112 or the like at the inboard sides of the frame arms. Each index disc 110 includes a generally circular array or recessed detents 114 at close angular intervals,- (eg about fifteen degree intervals) oriented coaxially with respect to the axis 24. The detents 114 are positioned to receive an associated respective pair of detent balls 116 (Figures 2 and 9) on the associated mounting shoes 106 for releasably locking the mounting shoes 106 in a selected angular position relative to the index disc 110 and frame arms 22. In the preferred form, these detent balls 116 are formed from a plastics material and are biased by a small spring 118 to protrude outwards from the mounting shoes with a selected spring biasing force. An adjustment screw 120 is provided for adjusting the spring force applied to the detent balls 116.

Accordingly, the clamp fixture of the present invention is can be securely mounted onto a variety of different support structures. The base bracket 16 is designed for quickly and easily locking firmly onto a selected support structure within a range of different sizes and shapes and physical orientations. Once the base bracket is locked into place, the frame member 18 is adjustable quickly and easily relative to the axis 20. Similarly, the instrument 12 is adjustable quickly and easily relative to the axis 24. This combination of adjustments with respect to the two perpendicular axes 20 and 24, both of which are oriented orthogonally to a primary axis of the support structure engaged by the base bracket, permit the instrument to be oriented in substantially any desired position for ease of operation, visibility and access. Alternatively, if desired, the clamp fixture 10 can be used to stabilise an instrument placed without clamping onto a flat support surface, in which case the fixture provides an extended structure protruding rearwardly from the instrument. Moreover, in use, the clamp fixture may be used to support various other medical or non-medical items in addition to the supported instrument.

Claims

1. A clamp fixture for supporting an instrument (12) in a selected orientation relative to a selected support structure, characterised by: a base bracket (16) including means for locking onto a selected support structure (14) extending generally along a first axis (19); a frame member (18) carried by the base bracket (16) for rotation with respect to the base bracket (16) about a second axis (20) at an angle to the first axis (19); first releasable lock means (94) for locking the frame member (18) against rotation about the second axis (20) relative to the base bracket (16); the frame member (18) including at least one frame arm (22); means for connecting (100) the or each frame arm (22) to the instrument (12) to permit rotation of the instrument (12) with respect to the or each frame arm (22) about a third axis (24) at an angle to the first (19) and second (20) axes; and second releasable lock means (116) for locking the instrument (12) supported by the or each frame arm (22) against rotation about the third axis (24) relative to the or each frame arm (22), the three axes preferably being mutually perpendicular.

2. A clamp fixture as claimed in Claim 1, characterised in that the base bracket (16) has a generally U-shaped configuration defining an axial channel (26) extending along the first axis (19), the base bracket (16) having an inner bracket support surface (32,34) and an adjustable clamp screw (42) movable towards and away from the inner bracket support surface (32,34) for respectively clamping and releasing the support structure (14) relative to the inner bracket support surface (32,34), the inner bracket support surface preferably including surface portions of different configuration for respectively engaging support structures of different geometry.

3. A clamp fixture as claimed in claim 2, characterised in that a first surface portion defines an elongate, generally semi-cylindrical recess (32) extending generally in parallel to the first axis (19), and a second surface portion defines a pair of relatively flat platforms (34) on either side of the recess (32), and optionally a resilient liner (36) is located over the first and second surface portions.

5. A clamp fixture as claimed in any of Claim 2 to 4 characterised by an adjustment knob (44) rotatably supported by the base bracket (16) and a clutch arrangement (64,66) interconnecting the adjustment knob (44), and the clamp screw (42) whereby the clamp screw (42) is movable towards and away from the inner bracket support surface (32,34) by manual rotation of the adjustment knob (44) the clutch means optionally being adjustable to vary the maximum torque transfer between the adjustment knob (44) and clamp screw (42), preferably by means of a non-standard adjustment tool (67).

6. A clamp fixture as claimed in Claim 5, characterised in that the clutch arrangement comprises a spring plate (66) carried by the adjustment knob (44), a cap member (58) carried by the clamp screw (42) and having at least one recessed seat (62), a drive ball (64) urged by the spring plate (66) into the recessed seat (62), and an adjustment screw (68) carried by the adjustment knob (44) in bearing engagement with the spring member (66), a specialised adjustment tool (67) being engageable with the adjustment screw (68) to vary the spring force applied to the drive ball (64) by the spring plate (66).

7. A clamp fixture as claimed in any of Claims 2 to 6 characterised in that the clamp screw (42) includes an inboard end (70) presented generally towards the inner bracket support surface (32,34) and a resilient shield (72) covering the clamp screw inboard end (70).

8. A clamp fixture as claimed in any preceding Claim, characterised in that the first releasable lock means includes means (94,102) for releasably locking the frame member (18) relative to the base bracket at rotational intervals of about ninety degrees, the first releasable lock means optionally comprising a spring-loaded lock pin (94) carried by the base bracket (16), a plurality of recessses (102) formed in the frame member (18), each recess (102) being positioned to receive the lock pin (94) when suitably aligned, and a trigger lever (100) on the base bracket (16) connected to the lock pin (94) for munually retracting the lock pin (94) from the aligned recess (102) to permit rotation of the frame member (18) relative to tne base bracket (16)

9. A clamp fixture as claimed in any preceding Claim characterised in that the second releasable lock means comprises a detent mechanism for releasably supporting the instrument (12) in one of a number of angular positions relative to the or each frame arm (22), the detent mechanism optionally comprising an index disc (110) mounted on the or each frame arm (22) and defining a generally circular array of recessed detents (114), and a mounting shoe (106) engaging the or each frame arm (122) generally along the third axis (24) and arranged to be connected to the instrument (12), the mounting shoe (106) supporting a detent ball (116) for removable reception into one of the recessed detents (114) in the index disc (110), the detent ball (116) optionally being biased outwards from the mounting shoe (106).

10. A clamp fixture as claimed in any preceding Claim, characterised in that there are a pair of frame arms (22), each having connecting means

(106) for engaging a respective side of the instrument, and each having second releasable lock means releasably locking the instrument (12) relative to the respective frame arm (22).

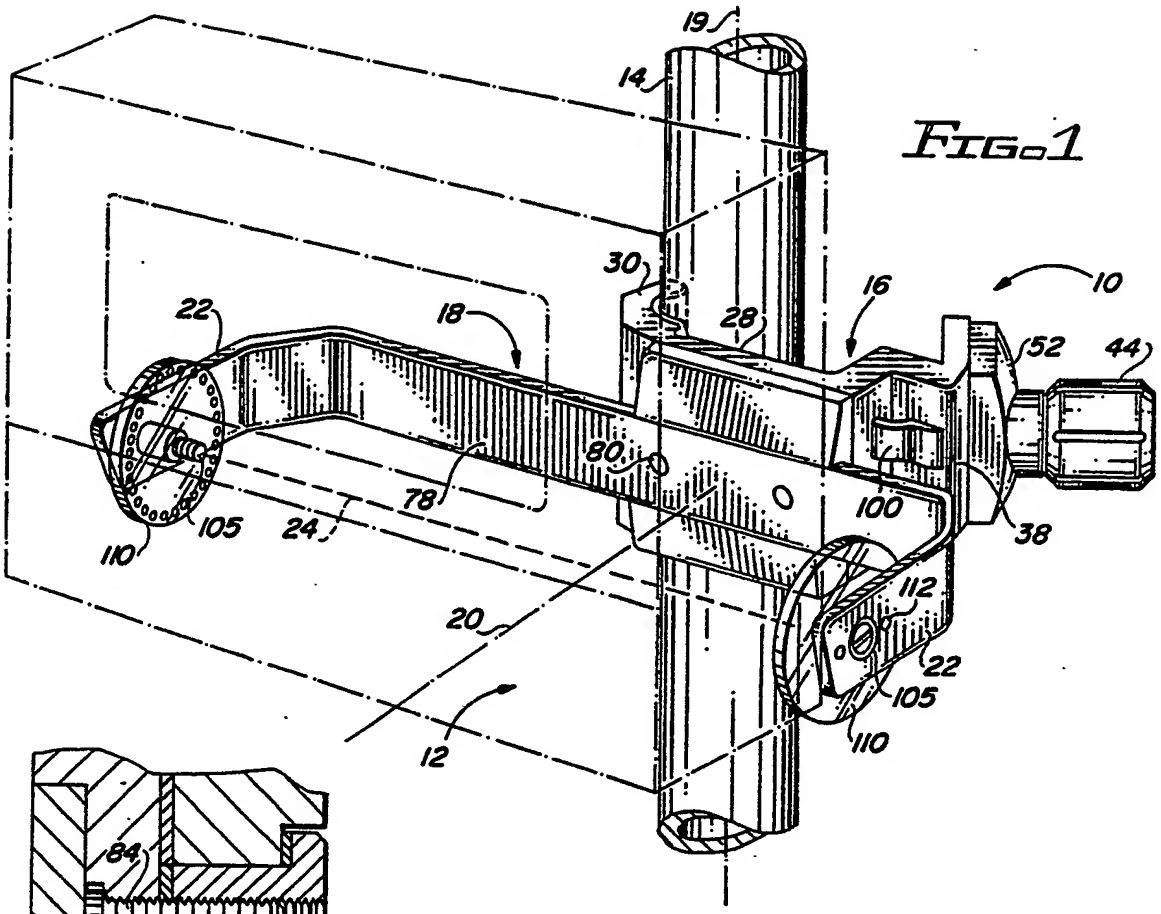

FIG. 1

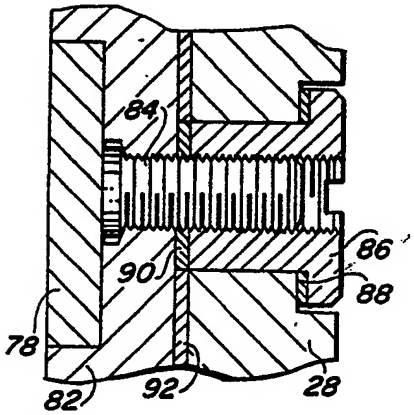

FIG. 5

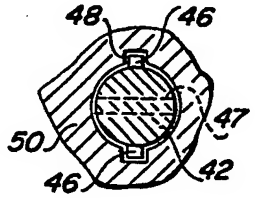

FIG. 4

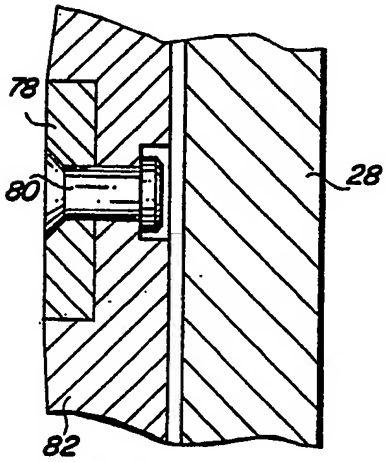

FIG. 6

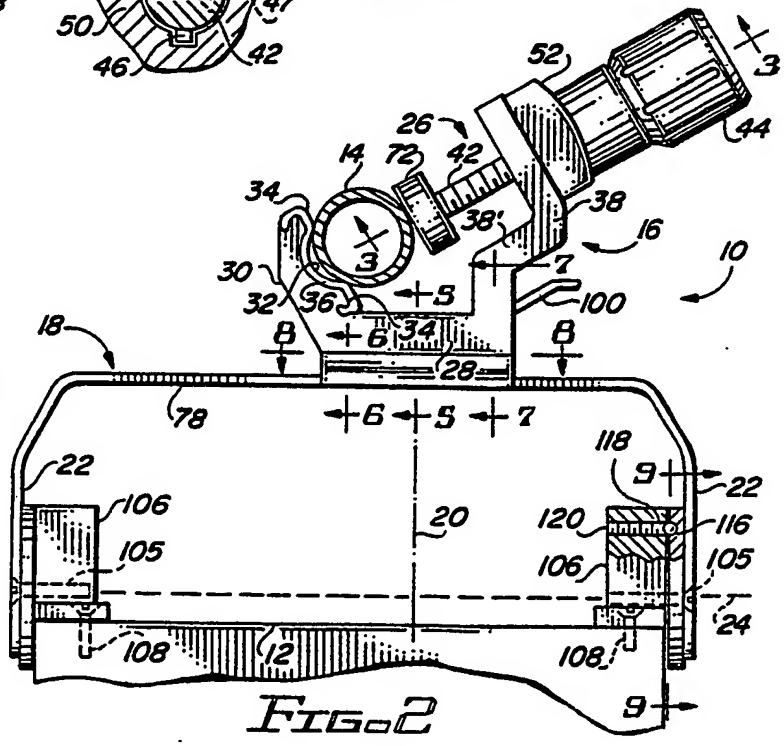

FIG. 2

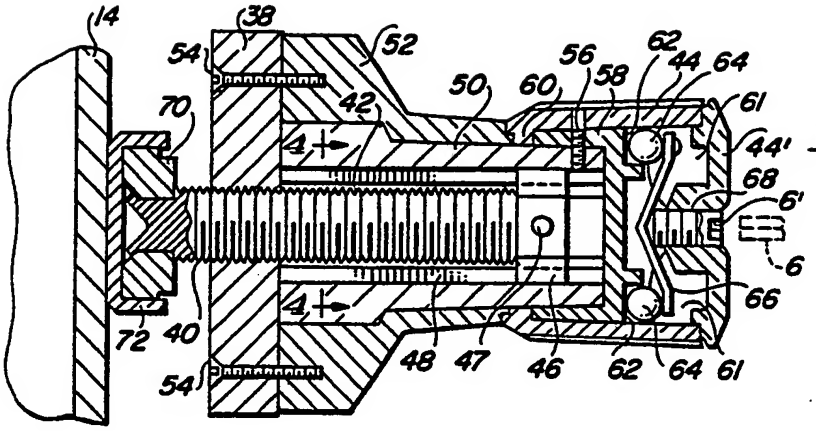

FIG. 3

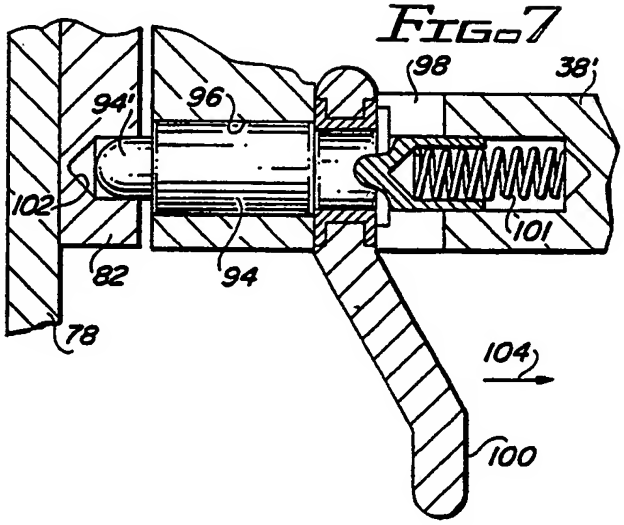

FIG. 7

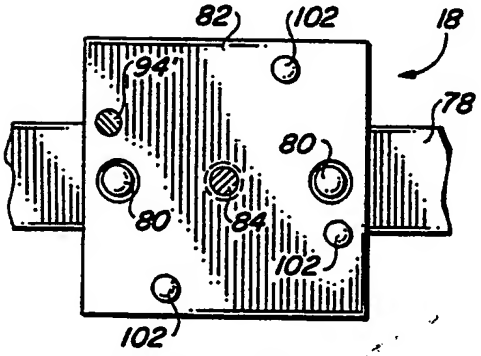

FIG. 8

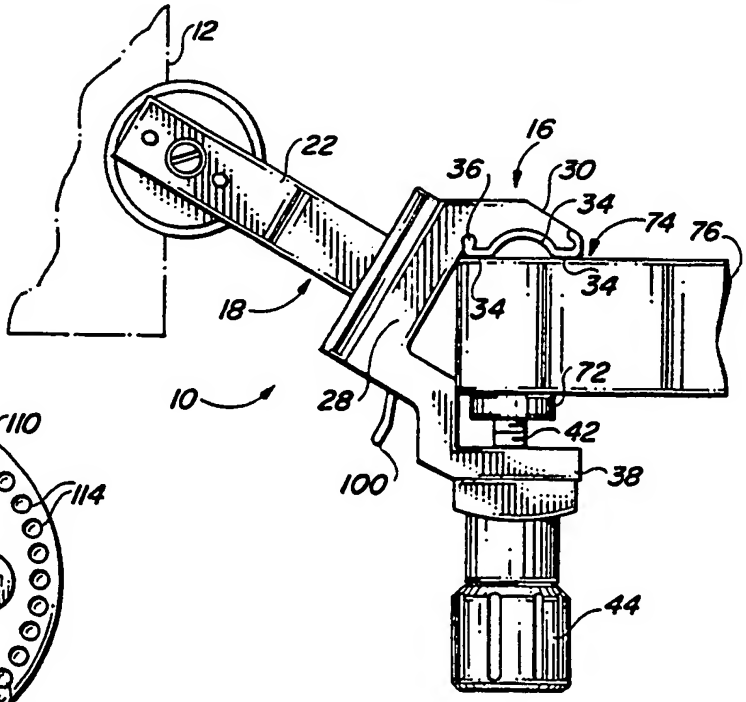

FIG. 10

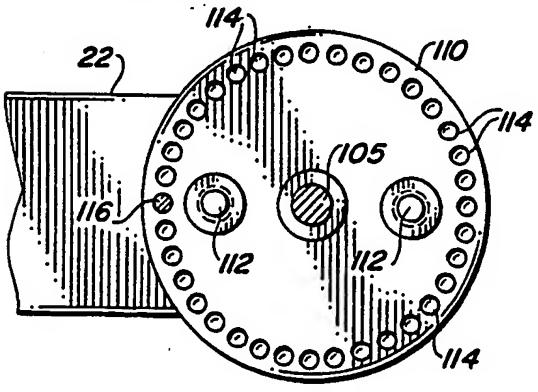

FIG. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 31 1341

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	GB-A-1 037 575 (M.C. HARLEY) * Page 2, lines 16-46; figures 1,2 *	1,10	F 16 M 11/12 F 16 M 13/02
X A	US-A-4 696 450 (K.C. HUANG) * Whole document *	1,10 8,9	
X	US-A-4 598 345 (J. KLEEMAN) * Column 2, line 46 - column 3, line 27; figures 1,2 *	1,2,10	
X	GB-A- 622 704 (B. KERNEY) * Page 3, lines 80-103; figures 1,2 *	1	
A	US-A-4 211 380 (T.R. LILLEGARD) * Column 2, line 61 - column 3, line 2; column 4, lines 11-33; figures 2,5 *	1,2,10	
A	GB-A-2 042 056 (A.C. PITTAS) * Page 1, lines 102-126; figure 1 *	2,3	
A	US-A-4 702 448 (F.X. LoJACONO) * Column 3, lines 50-57; figures 5,6 *	2,3	TECHNICAL FIELDS SEARCHED (Int. Cl.4) F 16 M F 16 C A 61 G
A	DE-U-8 500 205 (W. GEHMANN) * Page 7, line 24 - page 8, line 7; figure *	2,3	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-03-1989	BARON C.

CATEGORY OF CITED DOCUMENTS

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